Innovative Molybdenum Alloy for Extreme Operating Conditions, Phase I

Completed Technology Project (2006 - 2007)

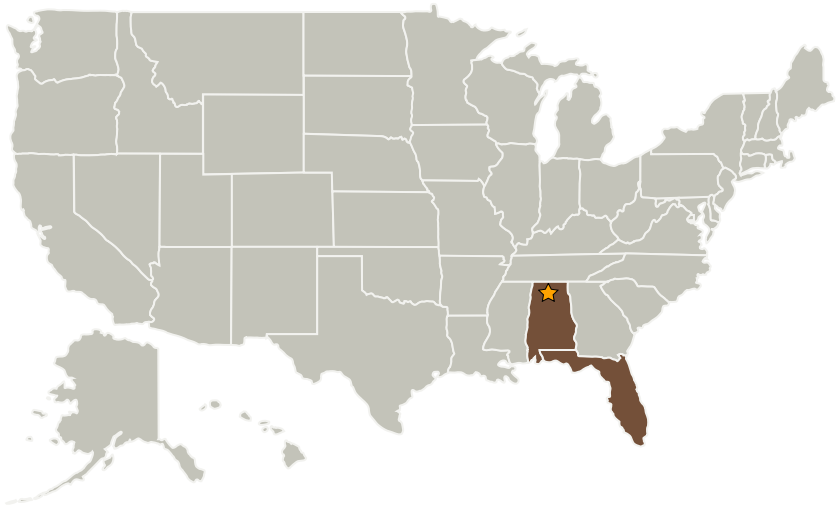
Project Introduction

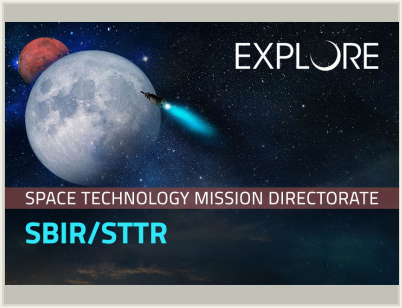
Molybdenum has been identified as a promising material for many high temperature NASA applications due to its high melting temperature, resistance to liquid metals, resistance to hot hydrogen, high thermal conductivity, and relatively low density. However, molybdenum's ductile to brittle transition temperature is above room temperature, which makes fabricating complex components extremely difficult by conventional fabrication techniques. Recent, advancements in Vacuum Plasma Spray (VPS) forming technology have enabled the fabrication of complex molybdenum and molybdenum-rhenium components. However, further increases in performance could be gained by the development of higher use temperature molybdenum alloys. During this investigation, innovative dispersion strengthened, molybdenum-rhenium alloys will be developed using VPS forming techniques and through the proper selection of advanced transition metal (TM) based ceramic dispersoids. These alloys have the potential to operate at temperatures greater than 1800°C for extend durations.

Anticipated Benefits

Potential NASA Commercial Applications: Additional commercial technologies include, aerospace and defense industries, nuclear power generation, welding electrodes, x-ray targets, warhead penetrators, shielding applications, high temperature furnace components, heat exchangers, heat pipes, etc.

Primary U.S. Work Locations and Key Partners





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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Marshall Space Flight Center (MSFC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Marshall Space Flight Center(MSFC)	Lead Organization	NASA Center	Huntsville, Alabama
Florida International University	Supporting Organization	Academia	Miami, Florida
Plasma Processes, LLC	Supporting Organization	Industry Veteran-Owned Small Business (VOSB)	Huntsville, Alabama

Primary U.S. Work Locations	
Alabama	Florida

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

John Scott S O'dell

Technology Areas

Primary:

- TX14 Thermal Management Systems
  - TX14.1 Cryogenic Systems
    - TX14.1.3 Thermal Conditioning for Sensors, Instruments, and High Efficiency Electric Motors